STATE & PRIVATE FORESTRY
FOREST HEALTH PROTECTION
SOUTH SIERRA SHARED SERVICE AREA

Report No. SS11-14

July 19th, 2011
File No. 3420

To: **Debra Whitman, Sequoia National Forest, Forest Supervisor**
John Exline, Hume Lake, District Ranger
Larry Burd, District Silviculturist

From: Forest Health Protection, South Sierra Shared Service Area

Re: **Interpretation of Roadside Hazard Tree, salvage marking guidelines.**

While the Regional Forest Health Protection guidelines for roadside salvage is still in draft status. We have reviewed the marking guidelines the forest is proposing to use on this specific project and have found them to reflect what would be the actions of a prudent and wise land manger. We have provided some additional clarification of your guidelines and are offering FHP assistance in delimiting root rot pockets that intersect with the buffer strip.

Figure 1. A Hazard Tree situation exists when there is a defective tree and a target within range.

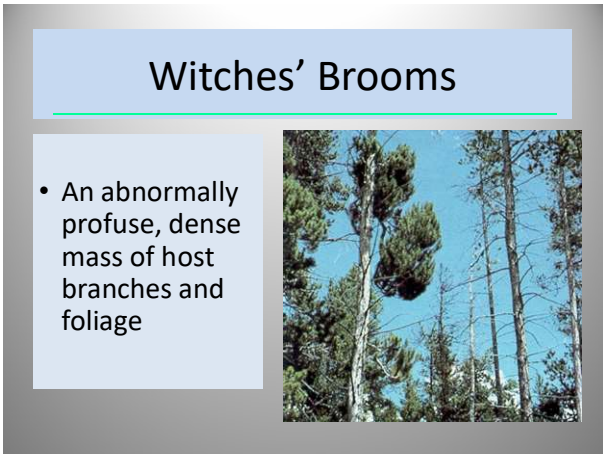
After a brief tour of some of the projects roads we came to the conclusion that the great bulk of the **2011 Roadside Hazard tree Removal project on the Hume Lake RD** will be involved in removing trees that are already dead. While no pathologist can tell you just when a dead tree is going to fail, all pathologists will tell you that a dead tree can not heal itself. In fact no tree can heal itself; all a tree can do is seal over a wound. Fire scars are never healed they are just sealed over. This approach to Hazard trees has led some pathologist to declare that ***"Dead wood is not negotiable"*** it must be removed if it is within the target zone. For the purposes of this project the target zone is one tree height from the road. Where the trees are shorter the target zone is narrower. Adopting this approach the forest need not consider the possibility of a domino effect from a bark beetle kill spot or a root rot pocket is at the edge of a stand. After a one tree height buffer strip has been cleared other root rot and bark beetle kills can be left in the stand, because they can not cause a domino effect that could reach the traveling public.

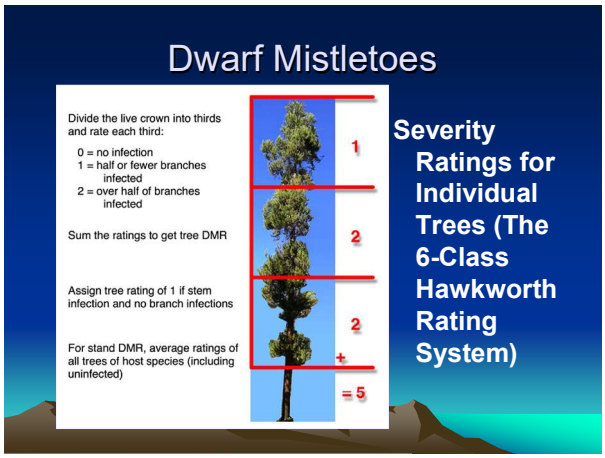
As soon as the R05 guidelines for marking roadside salvage trees are finalized we will place them on the www and E-mail links to all relevant staff within the Shared Service Area. In the mean time we direct your attention to the R06 guidelines, which are available at; http://www.fs.fed.us/r6/nr/fid/ After opening this page scroll to the bottom to find "other website of interest" and there you will find links to "Danger trees" and "Hazard trees" As there has long been a strong spirit of cooperation amongst western region pathologist the final R05 guidelines will not be significantly different from the R06 guidelines.

We would like to cover some of points that are specific to this red fir dominated project and then provide generalized guidelines that will assist in this project.

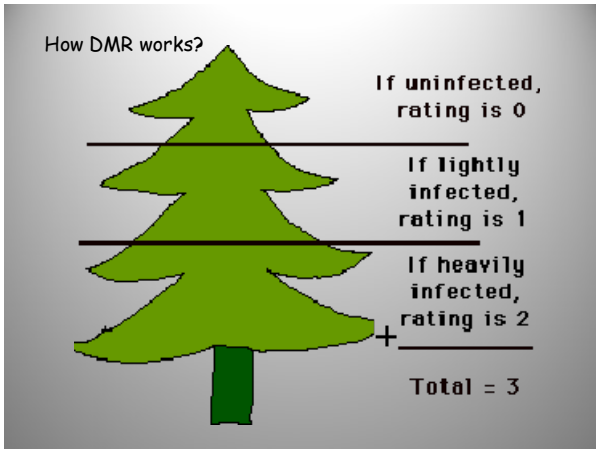
In a recent survey of Red Fir Decline in California Mortenson (2011) concluded that the rate of red fir decline had increased in recent years and that at the individual tree level now reaches 2.64% per annum. He identifies the red fir dwarf mistletoe as the single most important factor contributing to this mortality. Mathiasen *et al* (1990) working in Douglas fir concluded that the mortality level in stands heavily infested with dwarf mistletoes was 3-4 times as high as in healthy stands. When drawing up guidelines for managing another non-broom forming mistletoe, the gray pine dwarf mistletoe, Pronos *et al* (2004) suggest preferentially removing DMR trees rated 5 or 6. The preponderance of pathological advice suggest that it would be prudent and wise to remove trees with a Hawksworth Dwarf Mistletoe Rating of 5 or 6. As the true fir dwarf mistletoes rarely induce brooming a strict application of the DMR system will underestimate the severity of mistletoe infestations in true firs. However when, retired Pathologist, John Pronos drew up the draft guidelines you are using, he compensated for this underestimate by requesting firs with more than half of their crown already dead be removed. Below, we suggest strengthening the biology of his logic by using *Cytospora* infections as a surrogate for mistletoe infections.

As dwarf mistletoes on red fir rarely induce brooming the Hawksworth DMR system needs adapting.

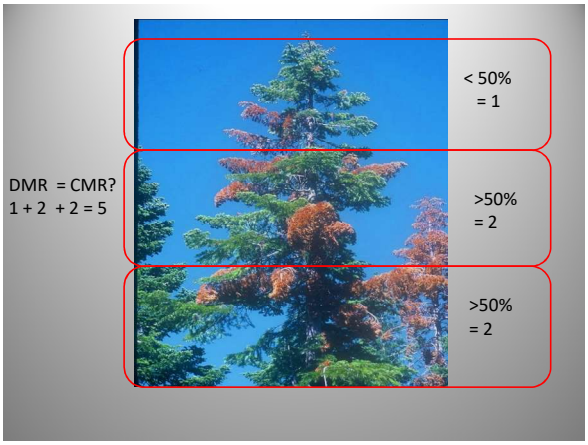



Dwarf Mistletoes
Divide the live crown into thirds and rate each third:
0 = no infection
1 = half or fewer branches infected
2 = over half of branches infected
Sum the ratings to get tree DMR
Assign tree rating of 1 if stem infection and no branch infections
For stand DMR, average ratings of all trees of host species (including uninfected)
1
2
2
+
=5
Severity Ratings for Individual Trees (The 6-Class Hawkworth Rating System)

On a Douglas fir or Ponderosa dwarf mistletoes induce brooming and this brooming led to the development of the well known 6 Class Hawksworth DMR system (Hawksworth, 1977)

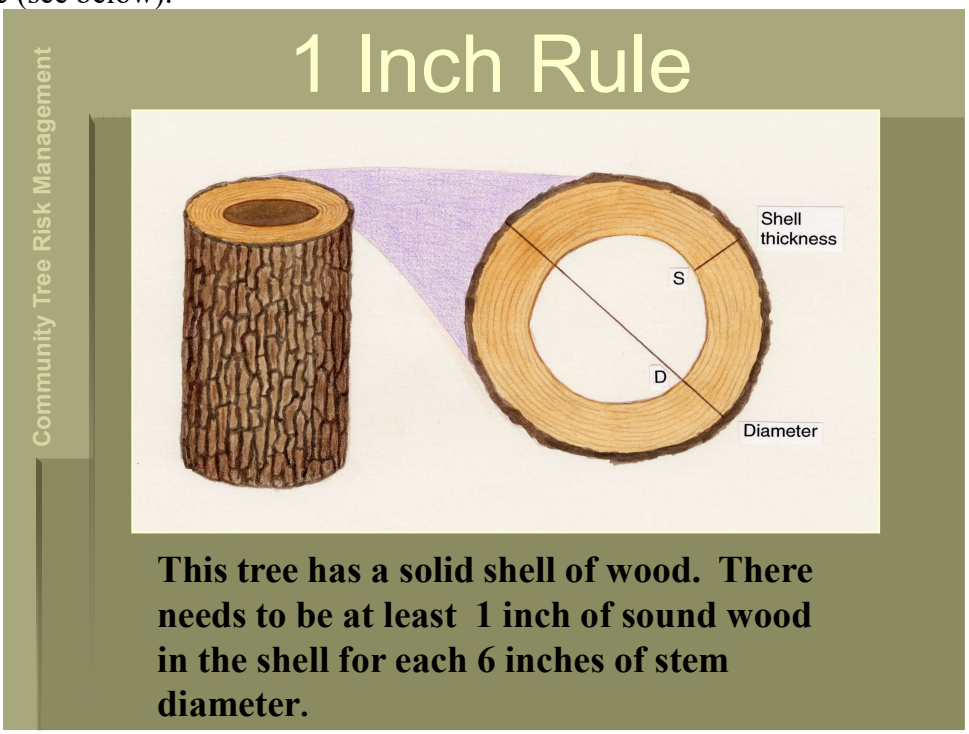


But, on red fir the Dwarf mistletoe rarely induces brooming and thus the system is difficult to apply. For this reason we suggest using ***Cytospora abietus*** induced flagging as a surrogate for mistletoe induced brooming. This becomes a Cytospora / mistletoe rating system.

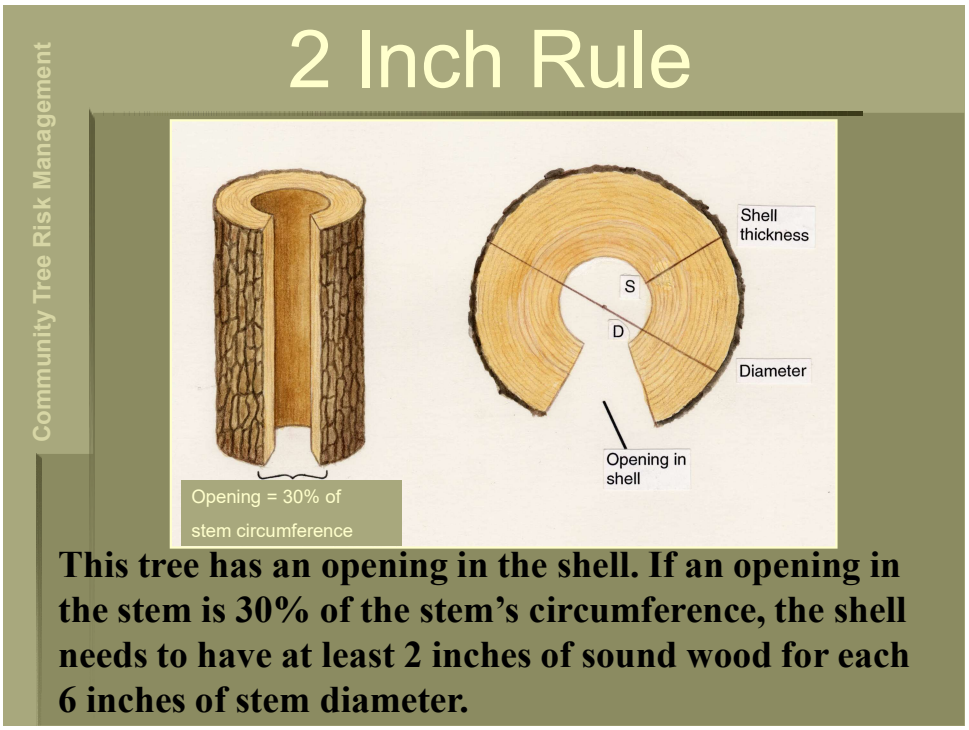


It is well known that in those species where the dwarf mistletoes induce brooming trees that rate a Hawkworth 5 or 6 are definite hazards. We know that the Cytospora flagging develops on branches that were previously dwarf mistletoe infected (Scharpf & Bynum, 1975) and thus we are suggesting that in red fir trees in which more than half of the crown is already dead should be marked for removal

The threat posed by heart rot columns.
In many cases a hollow pipe can support as much weight as a solid rod of the same outside diameter (Pokorny, 1992). It has generally been accepted by most regions that the critical cut off for most hazard tree situations is the point where the shell thickness is less than 1/6th of the diameter. This is expressed in the one inch rule (see below).

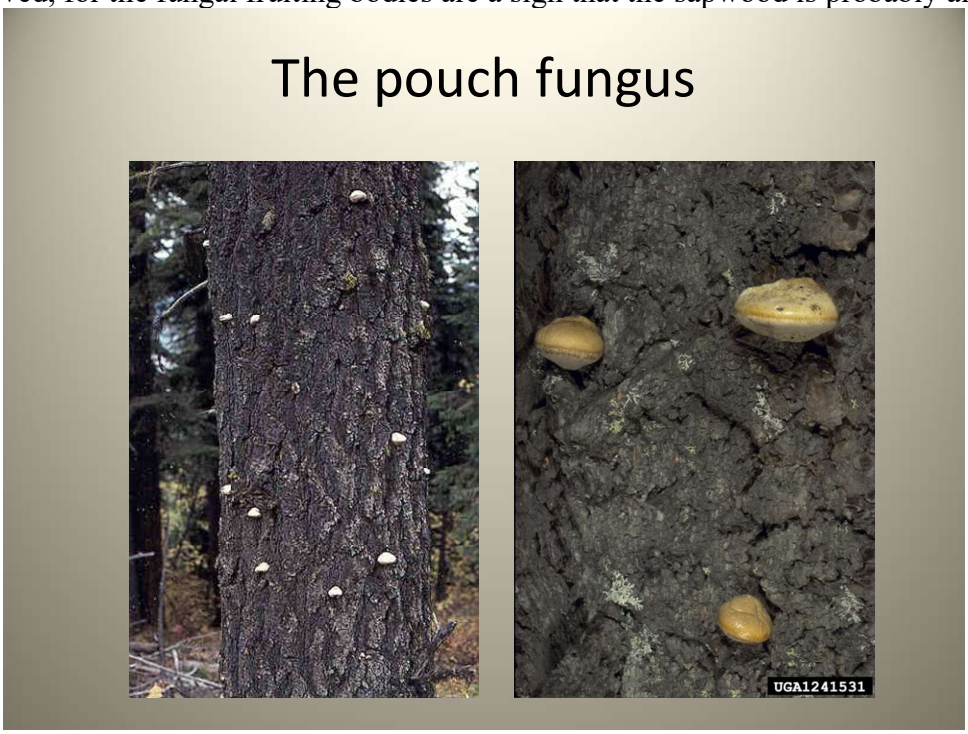

1 Inch Rule
Community Tree Risk Management
Shell thickness
S
D
Diameter
This tree has a solid shell of wood. There needs to be at least 1 inch of sound wood in the shell for each 6 inches of stem diameter.

Should the bottom of the pipe be open (as in the image below) it is recommended that the required shell thickness be doubled.


2 Inch Rule
Community Tree Risk Management
Shell thickness
S
D
Diameter
Opening in shell
Opening = 30% of stem circumference
This tree has an opening in the shell. If an opening in the stem is 30% of the stem's circumference, the shell needs to have at least 2 inches of sound wood for each 6 inches of stem diameter.

The pouch fungus

While these are the basic rules used in most regional hazard tree guidelines they do not take into account the decay caused by the pouch fungus, ***Cryptoporus volvatus*** (image below). The pouch fungus is a sap rot fungus and thus it preferentially attacks the outer sapwood, the very wood we count upon to provide the strength. Thus we would make a blanker recommendation that any tree with conks of the pouch fungus be removed, for the fungal fruiting bodies are a sign that the sapwood is probably already decayed.



Dead tops and steep "V" crotches.

In situations where bark beetles have killed the top of a tree we recommend the trees removal, provided the tree is closer to the target (road) than the length of the dead top. Even although it may be less than a tree height from the road a dead topped tree can be retained, so long as the distance to the road is greater than the length of the dead top. A similar argument can be made for multiple leadered tree that have a steep crotch angle and especially if there is evidence of a crack at the fork or bark being included in the crotch. These steep "V's" have tendency to shear and we feel it would be prudent and wise to remove them.

Pitch Tubes on living trees

Pink to reddish pitch tubes are numerous (>10), and are found over at least 1/3 of the circumference of the bole, at or above 5 feet, and extending at least 10 to 15 additional feet up the bole. The pitch tube criterion specifically excludes whitish pitch tubes that do not have pink or reddish boring dust associated with them and basal attacks by the red turpentine beetle (RTB) which are characterized by very large pitch tubes, associated with coarse boring dust, generally restricted to the lower 2 to 3 feet of the bole.

Boring dust or frass, pouch fungus conks and/or woodpecker activity

Any combination of boring dust or frass (in bark crevices, webbing along the bole, or that accumulates at the base of the trees), pouch fungus conks and/or current woodpecker activity (holes into the sapwood and/or bark flaking, specifically excludes injury caused by sapsucker feeding) present over at least 1/3 of the bole circumference. Specifically excludes these indicators when only associated with wounds, old fire scars, etc., or when woodpecker activity is restricted to the lower 2 to 3 feet of the bole.

Active crown fade
At least 50% of the live crown exhibiting current, active, contiguous, crown fade or dieback from the top or throughout the mid to upper crown. Specifically excludes older top-kill with very few or no needles remaining.

Scatterd branch dieback
Scattered branch mortality from *Cytospora*/dwarf mistletoe infection where 50% or more of the live crown has been recently killed and the remaining live crown ratio is less than 30%.

Please contact Forest Health Protection with any additional questions or concerns regarding interpretation of these marking guidelines. We do not think these guidelines in any way contradict older guidelines the forest is using, they were drawn up to augment and further explain the guidelines the forest is using. Additionally, our service area staff is available to provide technical support in defining the boundaries of any root rot centres that may intrude into the roadside buffer strip that has to be cleared of Hazards. The SA staff is available, at short notice, to provide Hazard Tree training for both roadside and campground settings.

Acknowledgements
In preparing this report we, consulted with, and drew upon the works of the R05 FHP staff; D. Cluck, P. Angwin, W. Woodruff, & P. Zambino. Additionally we consulted, G. Philip of R06 & J. Pokorny of NA. These guidelines are not meant to replace the earlier work by the retired pathologist J. Pronos, just provide supporting details.

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